

Response to

Request for Additional Information No. 91 (1263), Revision 0

10/2/2008

U. S. EPR Standard Design Certification

AREVA NP Inc.

Docket No. 52-020

SRP Section: 10.02 - Turbine Generator

Application Section: 10.2, "Turbine Generator"

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

Question 10.02-1:

FSAR Tier 2 Sections 10.2.2.5 through 10.2.2.8 describes the turbine generator (TG) control systems; including speed control, load control, valve control, and manual control of the TG system during various modes of plant operations. The applicant has stated that the TG control system is a fault-tolerant system using triple processors and two-out-of-three trip logic. Redundant communication paths are used between processors within the turbine control system, and redundant power supplies are provided for processors, input/output (I/O) modules, and field devices. SRP Section 10.2, "Turbine Generator," states that the reviewer verifies that the applicant has provided sufficient information and that the review and calculations (if applicable) support conclusions of the review. Therefore, the NRC staff requests the applicant to provide a schematic and logic diagram in the FSAR of all input signals to the triple processors and all outputs from the triple processors, so that staff can verify fault-tolerant features that are described in Section 10.2.2.5. Also, show all inter-channel signal paths between processors, and state whether signal paths are unidirectional or bi-directional. The staff further, requests the applicant to provide the following clarifications in the FSAR, as it relates to the TG control systems:

1. Define the term "fault-tolerant" as it relates to the "Single Failure Criterion."
2. Provide justification and explain the TG control systems' compliance with the single failure criterion.
3. If not, describe the Areva plan to meet this criterion.

The applicant should also respond to these question for the alternate TG design described in FSAR Section 10.2A.

Response to Question 10.02-1:

A response to this question will be provided by January 9, 2009.

Question 10.02-2:

Regarding overspeed control of the main turbine-generator, FSAR Tier 2 Section 10.2.2.9, "Overspeed Protection," describes two independent electrical over-speed trip devices are provided, each capable of quickly closing the main stop and control valves in the event of an unsafe condition. According to the FSAR, the primary electrical over-speed trip system fully closes the valves at about 110 percent of rated turbine speed, and also an independent and redundant backup electrical over-speed trip circuit is provided to fully close these valves at about 111% of rated speed. The staff finds these over-speed trip devices meet the criteria specified in Items 2.C (a mechanical overspeed trip device at 111 percent of turbine rated speed) and 2.D (an independent and redundant backup electrical overspeed trip device at 112 percent of the turbine rated speed) of SRP Subsection, "Review Procedures," of the SRP Section 10.2. However, the FSAR does not provide adequate information to conclude that the means of preventing over-speed is from diverse sources (i.e., electrical vs. mechanical). Therefore, the NRC staff requests the applicant to address the following additional information in the FSAR, as it relates to diversity feature for overspeed control of the main turbine:

1. Provide justification for the diversity of the two electrical over-speed systems.
2. Discuss the reason(s) for using a second electrical device in lieu of a mechanical device.
3. Clarify whether or not the two systems share any common components or process inputs. If so, provide an evaluation of the impact of failures of any such components.
4. Describe the software used for the triple processors or performing trip logic actuation.
5. Explain the diversity and defense-in-depth used to defend against a common cause failure (CCF) of the triple processor functions.
6. Confirm the objectives of Test #174 correctly described.

Response to Question 10.02-2:

A response to this question will be provided by December 12, 2008.

Question 10.02-3:

SRP Section 10.2, Turbine Generator, Subsection II, "Acceptance Criteria," Item 1.C, states that the TG should have the capability to permit periodic testing of components important to safety while the unit is operating at rated load.

FSAR Tier 2, Section 10.2A.2.12, "Turbine Inservice Inspection and Testing," states that the main steam stop and control valves, reheat stop and intercept valves, and steam extraction no return valves are exercised on a frequency consistent with turbine manufacturer recommendations. However, the application did not state whether or not valve design is such that monthly exercising can be performed at full load per the SRP. Therefore, the staff requests the applicant to clarify in the FSAR whether the EPR turbine is adequately designed such that each valve is capable of a full stroke closed at 100 percent full power.

Response to Question 10.02-3:

A response to this question will be provided by December 12, 2008.

Question 10.02-4:

In order to meet the GDC 4 criteria, FSAR Tier 2 Section 10.2A.2.12, states that TG valves are exercised periodically and observed for valve motion. Tier 1 Figure 2.8.1-1 indicates that exercising a single control or stop valve would result in the isolation of flow from a steam line and steam generator.

However, it is not clear from the FSAR, whether the TG stop or control valve in each of the main steam lines are arranged such that by closing a valve will allow diverting its steam flow to the other three. Therefore, the staff requests the applicant to describe in the FSAR, the details on the steam flow path during stop and control valve testing. Also, state in the FSAR, whether normal operation will utilize either full or partial arc control.

Response to Question 10.02-4:

A response to this question will be provided by December 12, 2008.